REMARKS/ARGUMENTS

Claims 1-14 are pending in this application. In view of the following, Applicants respectfully request reconsideration and allowance of Claims 1-14.

CLAIM REJECTIONS 35 U.S.C. § 102

Claims 1-14 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent 7,069,981 issued to Valensa et. al. (from hereon "Valensa"). Applicants respectfully request reconsideration.

As an initial matter, Applicants note that, in making the present rejection, the Examiner is arbitrarily combining elements from the prior art heat exchanger 22 illustrated in Fig. 1 with elements from the heat exchangers disclosed by Valensa (hereafter "the heat exchanger 50 disclosed by Valensa" and "the heat exchanger 30 disclosed by Valensa") and illustrated in Figs. 2-12. Applicants respectfully submit that it is improper to arbitrarily select features from each of the two distinct systems and to recombine those features to create a hypothetical prior art system because such a combination fails to recognize the significant differences between the two different heat exchangers. In addition, the heat exchanger 50 disclosed by Valensa is intended as an improvement upon and a replacement for the prior art system shown in Fig. 1. Accordingly, Valensa teaches away from the combination proposed by the Examiner. Moreover, as explained in more detail below, such a hypothetical combination still fails to include each and every element of Claims 1-14.

Independent Claim 1 specifies "[a] reformate cooling system for reducing the temperature of a reformate to within a desired temperature range for use in a fuel processing subsystem, the fuel processing subsystem including a process water flow that supplies water to a fuel flow in the fuel processing subsystem; the reformate cooling system comprising:

at least one heat exchanger unit to transfer heat from the reformate flow to a portion of the process water flow, the at least one heat exchanger including a coolant inlet, a coolant outlet, a coolant flow path to direct the portion of the process water flow from the coolant inlet to the coolant outlet, a reformate inlet, a reformate outlet, and a reformate flow path to direct the reformate flow from the reformate inlet to the reformate outlet with a concurrent flow relationship between the portion of the process water flow in the coolant flow path and reformate flow in the reformate flow path, the heat exchanger having a sufficient effectiveness to fully

vaporize the portion of the process water flow and bring the reformate flow and the portion of the process water flow toward a common exit temperature under normal operating conditions for the fuel processing subsystem;

a valve connected to the coolant inlet to control the flow rate of said portion of the process water flow to the coolant inlet;

a temperature sensor positioned to measure an outlet temperature of the reformate;

a controller connected to the temperature sensor and responsive thereto to selectively control the portion of the process water flow via the valve to regulate the common exit temperature to a desired temperature range."

Valensa does not teach or suggest at least one heat exchanger unit to transfer heat from the reformate flow to a portion of the process water flow as required by independent Claim 1. The Examiner incorrectly asserts on page 2 of the Office action that Valensa discloses "at least one heat exchanger unit (22) to transfer heat from the reformate flow to a portion of the process water flow (col. 1 lines 35-37)..." Valensa does not teach or suggest that the prior art heat exchanger 22 transfers heat from a reformate to a water flow. On the contrary, Valensa indicates that water is introduced to a mixture of air and methane fuel (as shown in Fig. 1) but not that the water introduced at or near the heat exchanger 22 is for heat exchange purposes with the fuel. Rather, tail gas heats the combined fuel and water mixture in the prior art heat exchanger 22.

Further, Valensa does not teach or suggest a heat exchanger including a coolant inlet, a coolant outlet, a coolant flow path to direct the portion of the process water flow from the coolant inlet to the coolant outlet, a reformate inlet, a reformate outlet, and a reformate flow path to direct the reformate flow from the reformate inlet to the reformate outlet with a concurrent flow relationship between the portion of the process water flow in the coolant flow path and reformate flow in the reformate flow path. The Examiner incorrectly asserts on pages 2 and 3 of the Office action that Valensa discloses the heat exchanger 22 "including a coolant inlet (entrance 62), a coolant outlet (exit 64), a coolant flow path (flow path 56) to direct the portion of the process water flow from the coolant inlet to the coolant outlet (explicitly shown in Fig. 3), a reformate inlet (entrance 68), a reformate outlet (exit 70), and a reformate flow path (flow path 58) to direct the reformate flow from the reformate inlet to the reformate outlet with a concurrent flow relationship between the portion of the process water in the coolant flow path and the reformate flow in the reformate flow path (explicitly shown in Fig. 2)..."

Valensa discloses in figure 3 an entrance 62, an exit 64, a flow path 56, an entrance 68, an exit 70, and a flow path 58 as part of the heat exchanger 50 disclosed by Valensa. This construction is not included in the prior art heat exchanger 22 as initially proposed by the Examiner. The heat exchanger 50 disclosed by Valensa and the prior art heat exchanger 22 perform different operations; and therefore, it is not reasonable to take elements from the heat exchanger 50 disclosed by Valensa and assert that these parts form a portion of the prior art heat exchanger 22. In addition, the entrance 62, the exit 64, and the flow path 56 of the heat exchanger 50 disclosed by Valensa do not provide a process water flow through the heat exchanger 50. On the contrary, the heat exchanger 50 disclosed by Valensa transfers heat between an "unhumidified air/methane mixture and the reformate." Col. 6, lines 36-37.

Moreover, Valensa does not disclose in figure 2 a concurrent flow relationship between the portion of the process water in the coolant flow path and the reformate flow in the reformate flow path. At best, Valensa discloses in figures 1 and 2 a flow of water and a flow of processed fuel entering the heat exchanger 22 though adjacent openings. However, the flow of water does not extend through the heat exchanger 22 and there is no heat exchange relationship between the flow of water and the flow of processed fuel. Rather, the water is mixed with the flow of fuel to humidify the fuel, and the humidified fuel exits the prior art heat exchanger 22 as a *common flow*. Additionally, the flows 52, 54 are humidified air/methane mixture and reformate, respectively.

Further, Valensa does not teach or suggest a heat exchanger having a sufficient effectiveness to fully vaporize the portion of the process water flow and bring the reformate flow and the portion of the process water flow toward a common exit temperature under normal operating conditions for the fuel processing subsystem. The Examiner incorrectly asserts on page 3 of the Office action that Valensa discloses the heat exchanger 22 "having a sufficient effectiveness to fully vaporized a portion of the process water flow and bring the reformate flow and the portion of the process water flow toward a common exit temperature..." Valensa does not teach or suggest vaporizing a water flow in a heat exchanger as a result of heat exchange relationship between a water flow path and a fuel flow path. As a matter of fact, neither the prior art heat exchanger 22 nor the heat exchanger 50 disclosed by Valensa have a water flow path and a fuel (or process fuel) flow path such that the exit temperature of the *vaporized water* (as a result of the heat exchange of the water flow path and the fuel flow path) and the fuel have a

common temperature. At best, Valensa discloses adding water to a fuel flow to create a *common flow path* as shown in figures 1 and 2 with respect to the prior art heat exchanger 22.

Further, Valensa does not teach or suggest a reformate cooling system including a valve connected to the coolant inlet to control the flow rate of said portion of the process water flow to the coolant inlet. The Examiner incorrectly asserts on page 3 of the Office action that Valensa discloses the reformate cooling system comprising "a valve (44) connected to the coolant inlet (via line 46) to control the flow rate of said portion of the process water flow to the coolant inlet...)." On the contrary, Valensa discloses in figure 2 a valve 44 connected to fuel flow inlet and a fuel flow outlet for bypassing fuel around the heat exchanger 30 disclosed by Valensa and not the prior art heat exchanger 22. As disclosed by Valensa, the heat exchanger 30 and the prior art heat exchanger 22 perform different operations and therefore it is not reasonable to take elements related to the heat exchanger 30 and assert that these elements can also relate to the prior art heat exchanger 22. Moreover, the valve 44 does not support or affect a *process water flow* of the heat exchanger 30. The heat exchanger 30 includes opposite flow paths for the same *fuel flow.*

Further, Valensa does not teach or suggest a reformate cooling system including a controller connected to a temperature sensor and responsive thereto to selectively control the portion of the process water flow via a valve to regulate the common exit temperature to a desired temperature range. The Examiner incorrectly asserts on page 3 of the Office action that Valensa discloses the reformate cooling system comprising a controller, such as the PID controller 42, connected to a temperature sensor 40 is responsive to control a portion of the process water flow via the valve 44 to regulate "the common exit temperature to a desired temperature rage (col. 2 lines 18-29)..." Continuing with the assumption that the Examiner refers to the heat exchanger 22 as the heat exchanger of Claim 1, Valensa discloses in figure 1 a PID controller 42 connected to a temperature sensor 40 and the valve 44 to control the amount of bypass fuel flow between an inlet and an outlet of a heat exchanger 30 and not the heat exchanger 22. As disclosed by Valensa, the heat exchanger 30 and the heat exchanger 22 perform different operations and therefore it is not reasonable to take parts related to one heat exchanger 30 and assert that these parts can also relate to the other heat exchanger 22. Moreover, the controller 42 connected to the valve 44 and the temperature sensor 40 do not support or affect *a process water flow* of the heat exchanger 30. The heat exchanger 30 includes

opposite flow paths for the same *fuel flow*. Further, neither heat exchanger 22 nor heat exchanger 30 (with the controller 42) have a water flow path and a fuel (or process fuel) flow path such that the exit temperature of the *vaporized water* (as a result of the heat exchange of the water flow path and the fuel flow path) and the fuel have a common temperature. At best, Valensa discloses adding water to a fuel flow path as shown in figures 1 and 2 with respect to the heat exchanger 22.

The Examiner incorrectly asserts on page 3 of the Office action that Valensa discloses "an active control loop (the connection of the temperature sensor 40 and the valve 44 to PID controller 42) to control the flow rate of the portion of the process water flow through the heat exchanger to maintain the common exit temperature within the desired temperature range (col. 2 lines 18-29)." As indicated above, neither the prior art heat exchanger 22 nor the heat exchanger 30 (with the controller 42) have a water flow path and a fuel (or process fuel) flow path such that "the active control loop" can control the flow rate of the water flow path. In addition, Valensa discloses that the PID controller 42 "adjusts a solenoid-controlled bypass valve 44 to shunt a portion of the humidified air/methane mixture around the heat exchanger 30 via bypass flow path 46." Col. 2, lines 18-29. Valensa does not teach or suggest the PID controller 42 affecting a water flow path such that the water flow path and the fuel flow path have a common exit temperature as required by independent Claim 1. At best, Valensa teaches *humidified fuel* flowing through two opposite flow paths in the heat exchanger 30 (and not through the heat exchanger 22).

Applicants note the Examiner incorrectly asserts Valensa anticipates the heat exchanger of independent Claim 1 as the heat exchanger 22 includes portions and/or elements of heat exchanger 30 shown in figure 1 and heat exchanger 50 shown in figure 2. The heat exchanger 22 is disclosed and described independently from heat exchangers 30 and 50. Moreover, the heat exchanger 22 performs different operations than each of the heat exchangers 30 and the heat exchanger 50, therefore it is not reasonable to take elements from heat exchangers 30 and 50 disclosed by Valensa and assert that these elements can also relate to the prior art heat exchanger 22. In addition, Valensa discloses that the heat exchanger 50 *replaces* the heat exchanger 30, the PID controller 42, the valve 44, and the temperature sensor 40. Accordingly, Valensa explicitly teaches away from combining elements of the heat exchanger 30 and the heat exchanger 50.

For at least these reasons, Valensa does not teach or suggest the subject matter defined by independent Claim 1. Accordingly, independent Claim 1 is allowable. Claims 2-5 depend from independent Claim 1, and are allowable for the same and other reasons.

Independent Claim 6 specifies "[a] method of operating a reformate cooling system for reducing the temperature of a reformate to within a desired temperature range for use in a fuel processing subsystem, the fuel processing subsystem including a process water flow that supplies water to a fuel flow in the fuel processing subsystem, the method comprising the steps of:

flowing a reformate through a first flow path;

flowing a portion of the process water through a second flow path with a concurrent flow relationship to the first flow path;

transferring heat from the reformate to the portion of the process water whereby the portion of the process water is fully vaporized and the reformate and the portion of the process water approach a common exit temperature; and

controlling the portion of the process water flow rate to regulate the temperature of the reformate exiting the first flow path."

Valensa does not teach or suggest a method of operating a reformate cooling system, the method including flowing a reformate through a first flow path and flowing a portion of the process water through a second flow path with a concurrent flow relationship to the first flow path. As indicated above, Valensa does not teach or suggest the heat exchanger 22 transferring heat from a reformate to a water flow. As a matter of fact, Valensa indicates that water from a water flow is *combined* with air and methane (from hereafter "fuel"), and that *tail gas* heats this fuel mixture. At best, Valensa discloses in figures 1 and 2 a flow of water and a flow of processed fuel entering the heat exchanger 22 though adjacent openings. The water is mixed with the flow of fuel to humidify the fuel, and the humidified fuel exits the prior art heat exchanger 22 as a *common flow*.

Further, Valensa does not teach or suggest a method to operate a reformate cooling system, the method including transferring heat from the reformate to the portion of the process water whereby the portion of the process water is fully vaporized and the reformate and the portion of the process water approach a common exit temperature. More specifically, Valensa does not teach or suggest the heat exchanger 22 having a water flow path and a fuel (or process

fuel) flow path such that transferring heat between the water flow path and the fuel flow path vaporizes the water in the water flow path and the exit temperature of the *vaporized water* (as a result of the heat exchange of the water flow path and the fuel flow path) and the fuel have a common temperature. At best, Valensa discloses adding water to a fuel flow path as shown in figures 1 and 2 with respect to the heat exchanger 22. However, the flow of water does not extend through the heat exchanger 22 and there is no heat exchange relationship between the flow of water and the common flow of fuel.

For at least these reasons, Valensa does not teach or suggest the subject matter defined by independent Claim 6. Accordingly, independent Claim 6 is allowable. Claims 7-9 depend from independent Claim 6, and are allowable for the same and other reasons.

Independent Claim 10 specifies "[a] reformate cooling system for reducing the temperature of a reformate to within a desired temperature range for use in a fuel processing subsystem, the fuel processing subsystem including a process water flow that supplies water to a fuel flow in the fuel processing subsystem; the reformate cooling system comprising:

at least one heat exchanger unit to transfer heat from the reformate flow to a portion of the process water flow, the at least one heat exchanger including a coolant inlet, a coolant outlet, a coolant flow path to direct the portion of the process water flow from the coolant inlet to the coolant outlet, a reformate inlet, a reformate outlet, and a reformate flow path to direct the reformate flow from the reformate inlet to the reformate outlet with a concurrent flow relationship between the portion of the process water flow in the coolant flow path and reformate flow in the reformate flow path, the heat exchanger having a sufficient effectiveness to fully vaporize the portion of the process water flow and bring the reformate flow and the portion of the process water flow toward a common exit temperature under normal operating conditions for the fuel processing subsystem;

an active control loop to control the flow rate of the portion of the process water flow through the heat exchanger to maintain the common exit temperature within the desired temperature range."

Valensa does not teach or suggest all the claimed elements of independent Claim 10. More specifically, Valensa does not teach or suggest at least one heat exchanger unit to transfer heat from the reformate flow to a portion of the process water flow as required by independent

Claim 10. The Examiner incorrectly asserts on page 2 of the Office action that Valensa discloses "at least one heat exchanger unit (22) to transfer heat from the reformate flow to a portion of the process water flow (col. 1 lines 35-37)..." Valensa does not teach of suggest that the heat exchanger 22 of Valensa transfers heat from a reformate to a water flow. On the contrary, Valensa indicates that water is introduced to a mixture of air and methane fuel from a water flow (as shown in Fig. 1) but not that the water introduced at or near the heat exchanger 22 is for heat exchange purposes with the fuel. Rather, tail gas heats the combined fuel and water mixture in the prior art heat exchanger 22.

Further, Valensa does not teach or suggest a heat exchanger including a coolant inlet, a coolant outlet, a coolant flow path to direct the portion of the process water flow from the coolant inlet to the coolant outlet, a reformate inlet, a reformate outlet, and a reformate flow path to direct the reformate flow from the reformate inlet to the reformate outlet with a concurrent flow relationship between the portion of the process water flow in the coolant flow path and reformate flow in the reformate flow path. The Examiner incorrectly asserts on pages 2 and 3 of the Office action that Valensa discloses the heat exchanger 22 "including a coolant inlet (entrance 62), a coolant outlet (exit 64), a coolant flow path (flow path 56) to direct the portion of the process water flow from the coolant inlet to the coolant outlet (explicitly shown in Fig. 3), a reformate inlet (entrance 68), a reformate outlet (exit 70), and a reformate flow path (flow path 58) to direct the reformate flow from the reformate inlet to the reformate outlet with a concurrent flow relationship between the portion of the process water in the coolant flow path and the reformate flow in the reformate flow path (explicitly shown in Fig. 2)..."

Valensa discloses in figure 3 an entrance 62, an exit 64, a flow path 56, an entrance 68, an exit 70, and a flow path 58 as part of the heat exchanger 50 disclosed by Valensa. This construction is not included in the prior art heat exchanger 22 as initially proposed by the Examiner. The heat exchanger 50 disclosed by Valensa and the prior art heat exchanger 22 perform different operations; and therefore, it is not reasonable to take elements from the heat exchanger 50 disclosed by Valensa and assert that these parts form a portion of the prior art heat exchanger 22. In addition, the entrance 62, the exit 64, and the flow path 56 of the heat exchanger 50 disclosed by Valensa do not provide a process water flow through the heat exchanger 50. On the contrary, the heat exchanger 50 disclosed by Valensa transfers heat between an "unhumidified air/methane mixture and the reformate." Col. 6, lines 36-37.

Further, Valensa does not teach or suggest a heat exchanger having a sufficient effectiveness to fully vaporize the portion of the process water flow and bring the reformate flow and the portion of the process water flow toward a common exit temperature under normal operating conditions for the fuel processing subsystem. The Examiner incorrectly asserts on page 3 of the Office action that Valensa discloses the heat exchanger 22 "having a sufficient effectiveness to fully vaporize a portion of the process water flow and bring the reformate flow and the portion of the process water flow toward a common exit temperature..." Valensa does not teach or suggest vaporizing a water flow in a heat exchanger as a result of heat exchange relationship between a water flow path and a fuel flow path. As a matter of fact, neither the prior art heat exchanger 22 nor the heat exchanger 50 disclosed by Valensa have a water flow path and a fuel (or process fuel) flow path such that the exit temperature of the *vaporized water* (as a result of the heat exchange of the water flow path and the fuel flow path) and the fuel have a common temperature. At best, Valensa discloses adding water to a fuel flow to create a *common flow path* as shown in figures 1 and 2 with respect to the prior art heat exchanger 22.

Further, Valensa does not teach or suggest a reformate cooling system including an active control loop to control the flow rate of a portion of the process water flow through a heat exchanger to maintain the common exit temperature within the desired temperature range. The Examiner incorrectly asserts on page 3 of the Office action that Valensa discloses "an active control loop (the connection of the temperature sensor 40 and the valve 44 to PID controller 42) to control the flow rate of the portion of the process water flow through the heat exchanger to maintain the common exit temperature within the desired temperature range (col. 2 lines 18-29)." As indicated above, neither the prior art heat exchanger 22 nor heat exchanger 30 (with the controller 42) have a water flow path and a fuel (or process fuel) flow path such that "the active control loop" can control the flow rate of the water flow path. In addition, Valensa discloses that the PID controller 42 "adjusts a solenoid-controlled bypass valve 44 to shunt a portion of the humidified air/methane mixture around the heat exchanger 30 via bypass flow path 46." Col. 2, lines 18-29. Valensa does not teach or suggest the PID controller 42 affecting a water flow path such that the water flow path and the fuel flow path have a common exit temperature as required by independent Claim 10. At best, Valensa teaches *humidified fuel* flowing through two opposite flow paths in the heat exchanger 30 (and not through the prior art heat exchanger 22).

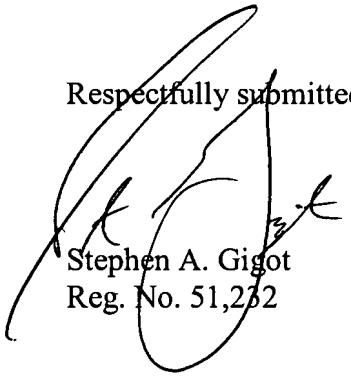
In addition, the Examiner incorrectly asserts Valensa anticipates the heat exchanger of independent Claim 10 as the heat exchanger 22 includes portion and/or elements of heat exchanger 30 shown in figure 1 and heat exchanger 50 shown in figure 2. The heat exchanger 22 is disclosed and described independently from heat exchangers 30 and 50. Moreover, the heat exchanger 22 performs different operations than each of the heat exchangers 30 and the heat exchanger 50, therefore it is not reasonable to take parts related to heat exchangers 30 and 50 and assert that these parts can also relate to the heat exchanger 22. In addition, Valensa discloses that the heat exchanger 50 *replaces* the heat exchanger 30, the PID controller 42, the valve 44, and the 40. Accordingly, Valensa explicitly teaches away from combining elements of the heat exchanger 30 and the heat exchanger 50.

For at least these reasons, Valensa does not teach or suggest the subject matter defined by independent Claim 10. Accordingly, independent Claim 10 is allowable. Claims 11 – 14 depend from independent Claim 10, and are allowable for the same and other reasons.

CONCLUSION

In view of the above remarks, Applicant respectfully requests allowance of Claims 1-14. The undersigned is available for telephone consultation during normal business hours.

Respectfully submitted,



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